

The Southern Timber Market to 2040

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ABSTRACT

Timber market analysis of the South's predominantly private timberland finds that the 13 southern states produce nearly 60 percent of the nation's timber, an increase from the mid-1900s. Projections with the Subregional Timber Supply model show that, despite a 67 percent increase in the area of pine plantations, the South will experience a 2 percent decline in private timberland area as other forest types shrink. Because of expected productivity gains for plantation forests and conversions of some agricultural lands to natural forests, the South's industrial wood output is projected to increase by more than 50 percent between 1995 and 2040.

Keywords: economics; harvesting; plantations

Southern timber markets have undergone a steady transformation over the past 40 years. Investments in plantation and intensive forest management, population growth, and the decline of the southern agricultural sector have moved the timber sector from an equal player with western markets to one dominant in North America and the world. Southern timber is demanded and supplied at increasingly higher levels. The South is the world's largest single industrial wood producer, and its influence is felt in international markets for many kinds of timber products—from kraft paper to hardwood lumber to fine furniture. Changing demographic characteristics and growing demand for nontimber values obtained from forests have given rise to concerns about increasing harvests, intensive forest management, and the future of natural forests.

The Southern Forest Resource Assessment (SFRA) addressed questions regarding the history, status and projected future demands for and supplies

of wood products in the South (Prestemon and Abt, in press).

Historical Background

Timber production in the United States has shifted among regions since the 1800s, and today finds the South the primary producing region in the country (Haynes et al. 2002). Because the South produces most of its timber products from private forests, the increase in output observed in the South implies that investment opportunities for intensive forest management on these lands and subsequent product manufacture have improved in the South relative to other regions (Murray and Wear 1998; Guan and Munn 2000).

The South produced 41 percent of the country's wood fiber output in 1952 and 58 percent in 1997. Over the same period, the South's share of the world's industrial wood production rose from 6.3 to 15.8 percent. Today, fully 18 percent of the world's industrial timber products comes from

southern states. Although the United States has remained the world's largest producer of industrial timber for the past 40 years, producing a stable 25 percent of total world supply, rising southern output means that the South's share of that production has grown substantially.

Modeling Approach

Trends in the southern timber sector were projected with the Subregional Timber Supply (SRTS) model (Abt et al. 2000). The SRTS model projects private timber inventories, growth, removals, prices, land use, and timberland area by five broad forest management types at substate and ecoregion (Bailey 1995) levels. Results are broken out by broad ownership categories: nonindustrial private forestry (NIPF) and industry (which includes nonforest industry corporate owners, such as timber investment management organizations). The SRTS projections are based on the results of empirical models of timber and land supply and demand in relation to prices, income, and other variables. The projection period for SFRA was 1995 to 2040.

SRTS has several exogenous inputs and assumptions—prespecified variables that set the context of the model solution. One variable that affects future harvest behavior is the level of national timber demand, which had been continually rising, at least until the latest economic recession. However, de-

mand is inherently hard to predict: It depends on the status of the national and global economy, interest rates, housing markets, and a variety of other highly volatile factors. Our SRTS projections examined the detailed supply response to overall increasing demand to the year 2040.

We ran the model under four projection scenarios: a base case and three alternative scenarios using different assumptions about how pine plantations grow on industrial and nonindustrial private lands and how timber demand responds to prices. Scenario-based modeling permits one to examine the consequences of modeling assumptions. Studying the differences in results across scenarios can be more informative than the specific results of any one scenario. Hence, we projected the future based on two demand price-sensitivity assumptions and two pine plantation productivity assumptions. The combinations of these yielded four scenarios:

- IH: the base case of *inelastic* (price-insensitive) demand and *high*

plantation growth rate increase (75 percent increase in growth rate on industrial and corporate-owned plantations between 1995 and 2040, and 37.5 percent on NIPF plantations).

field messages

- The forecast for the South is continued strength in both softwood and hardwood markets. Thus there will be strong forest investment opportunities as well as expanded demand for forest management services for private landowners.

- The area of pine plantations is forecast to increase by about **67 percent** by 2040, and plantation management is expected to increase in intensity—that is, more thinnings and other intermediate treatments will be necessary.

- Demand for hardwood products is forecast to increase significantly, and this may signal an important investment opportunity for the future. Accordingly, the demand for skills in hardwood silviculture is likely to grow.

- A challenge for forest managers will be to manage smaller tracts for profit while also meeting other landowner objectives. While forest operations technologies enhance economic viability and decrease environmental impacts, they are currently inaccessible for small landowners due to scale economies. This could create opportunities for landowner cooperatives or similar collective ventures.

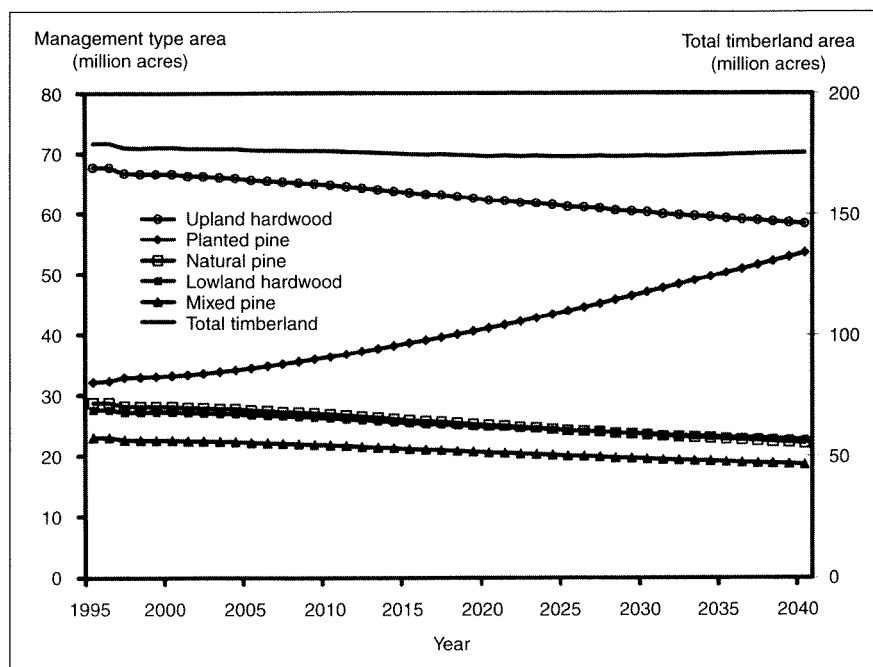


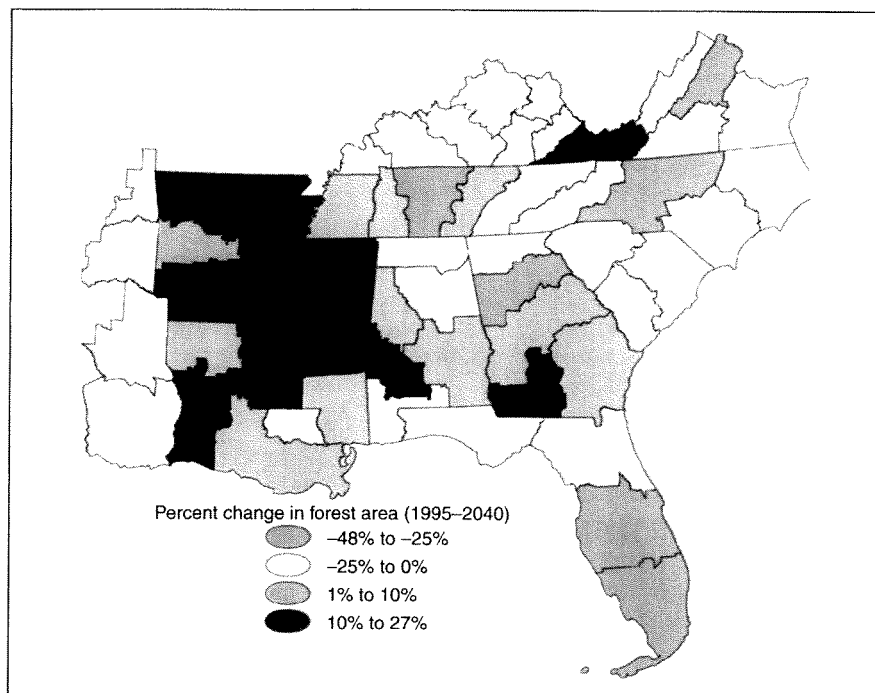
Figure 1. Projections of private timberland area by management type, 1995–2040, under the base case (IH) assumptions of inelastic timber demand and high plantation volume growth rate increases.

- IL: *inelastic* demand and *low* plantation growth rate increase (50 percent increase in growth rate on industrial and corporate-owned plantations between 1995 and 2040, and 25 percent on NIPF plantations).

- EH: *elastic* (price-sensitive) demand and *high* growth rate increase.

- EL: *elastic* demand and *low* growth rate increase.

The 2000 Resource Planning Act (RPA) assessment projections (Haynes et al. 2002) provided national and global context, but we used SRTS to project southern forest area, harvests (removals), growth, and inventory. Initial inventory, net growth, and removals used in the SRTS projections were obtained from USDA Forest Service Forest Inventory and Analysis (FIA) data, reported periodically by the states. Some of these states had relatively old surveys; the older the survey, the less confidence we have in specific projections. These concerns arise especially in South Carolina (because of Hurricane Hugo's effects on growth rates of trees in natural stands) and in Alabama, Kentucky, Louisiana, North Carolina, Texas, and Virginia.



timberland area, 1995–2040, under assumptions of inelastic timber demand and high plantation volume growth rate increases.

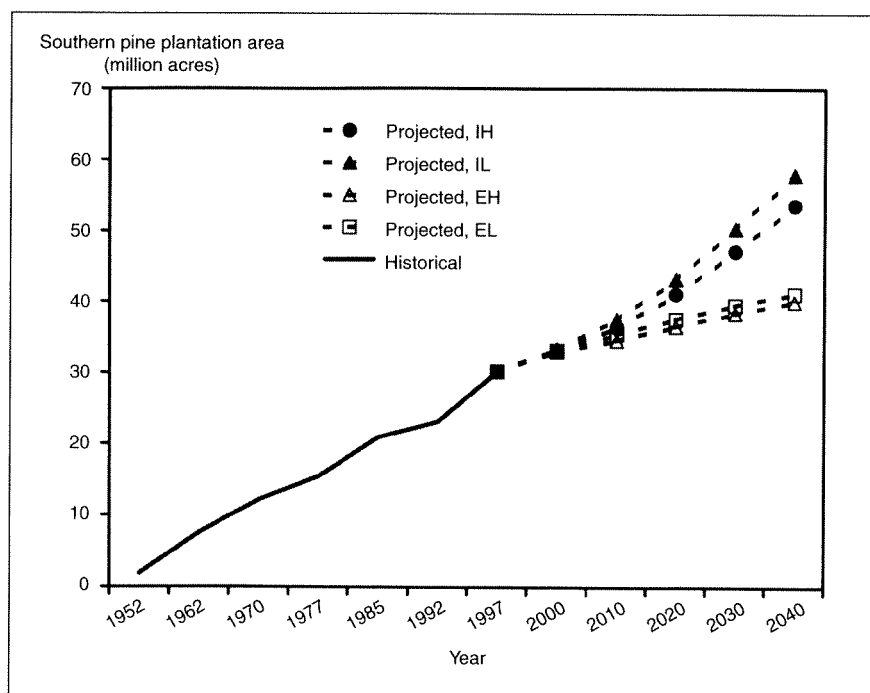


Figure 3. Pine plantation area projections by scenario, and historical pine plantation area on private land in the South, 1952–2040.

Projection Results

Projections for private timberland under the base case (IH) scenario for FIA survey units show the South losing private timberland over the coming decades. This loss, amounting to 2 per-

cent from 1995 to 2040, is net of an aggregate increase in the area of pine plantations and an aggregate decrease in the area of other forest types (fig. 1). A detailed map of forest area changes (fig. 2) shows that private timberland area is

projected to increase in the western parts of the South, with losses in states along the southern Atlantic seaboard. The projected gains in private timberland area, facilitated by rising timber prices relative to agricultural rents, are concentrated in Alabama, Arkansas, Louisiana, and Mississippi. Significant percentage losses are projected for Florida, North Carolina, South Carolina, Tennessee, Texas, and Virginia and will likely be concentrated near urban areas; some rural locations may gain forest area. But all of Florida and South Carolina's FIA survey units are projected to lose private timberland.

Softwoods. Pine plantation areas are projected to increase by 21 million acres (67 percent) under the IH scenario between 1995 and 2040 (fig. 3). This increase mirrors the losses of natural forest management types under private ownership, but private timberland area remains largely unchanged from 1995 to 2040. For the EH and EL scenarios—in which demand is highly price sensitive—pine plantation area is projected to increase by only about 25 percent, resulting in a net loss in private timberland area of just over 27 million acres (15 percent) between 1995 and 2040. This slower increase in plantation acres occurs because prices, to which pine planting responds positively, do not increase as much under the elastic demand scenarios.

Under the IH and IL scenarios, pine plantation area increases at the expense of private timberland in other forest types, but other land-use changes also occur. During the 1980s and 1990s, about 30 percent of new pine plantation acres in the South derived from agricultural land, and the rest came from conversion of natural forest management types. Natural forests have also been converted to urban uses—a trend that is projected to continue. We anticipate that increased private pine plantation acreage will come from agricultural land as well as from natural forest management types. Gulf Coast states and the coastal and Piedmont regions of Atlantic Coast states will gain the most pine plantations; northern and interior regions will gain the least.

Projections of pine plantation area are sensitive to assumptions regarding

forest productivity. Comparing scenarios IH and IL shows that each percentage point increase in growth rate above a 50 percent increase for industry (and each 0.5 percentage point increase above 25 percent for NIPF) results in about 170,000 fewer acres of projected pine plantations by 2040. Similarly, each percentage point increase in the pine plantation growth rate for industry (0.5 percent for NIPF) is projected to “save” about 50,000 acres of natural forest. If demand is very responsive to timber prices, as in the EH and EL scenarios, however, the importance of this tradeoff is diminished.

Figure 4 details the changes by state in pine plantation area projected in the IH scenario. Pine plantation area changes vary among southern states mostly because of differences in the area of industrial forests, the proportion of natural pine forests to other types (natural pine stands are more frequently converted to plantations), and land-use changes to and from nonforest. In all states except Kentucky, pine plantation area is projected to grow at least 45 percent from 1995 to 2040, with the largest percentage gains in Tennessee (120 percent), Arkansas (117 percent), and Alabama (89 percent). Georgia, the state with the most pine plantations in 1995 (6.4 million acres), is projected to have 9.3 million acres in 2040. Alabama, with the second most in 1995 (4 million acres), is projected to have 7.5 million acres.

Increased area in planted pine under the IH and the IL scenarios would also lead to a rise in timber inventories. Under the base case (IH) scenario, softwood growth is projected to exceed removals during the entire 40-year period (fig. 5). This finding holds for the other scenarios as well. Softwood harvests are projected to increase most in percentage terms in the northern reaches of the South (Kentucky, Tennessee, Arkansas, and Oklahoma) and least in southeastern parts (fig. 6a, p. 20). In absolute terms (volume per year), the results are more complicated (fig. 6b, p. 20). Large volume increases are projected in some places that have always been major producing regions (Georgia, Alabama, and Louisiana) and in some that have not (parts of the

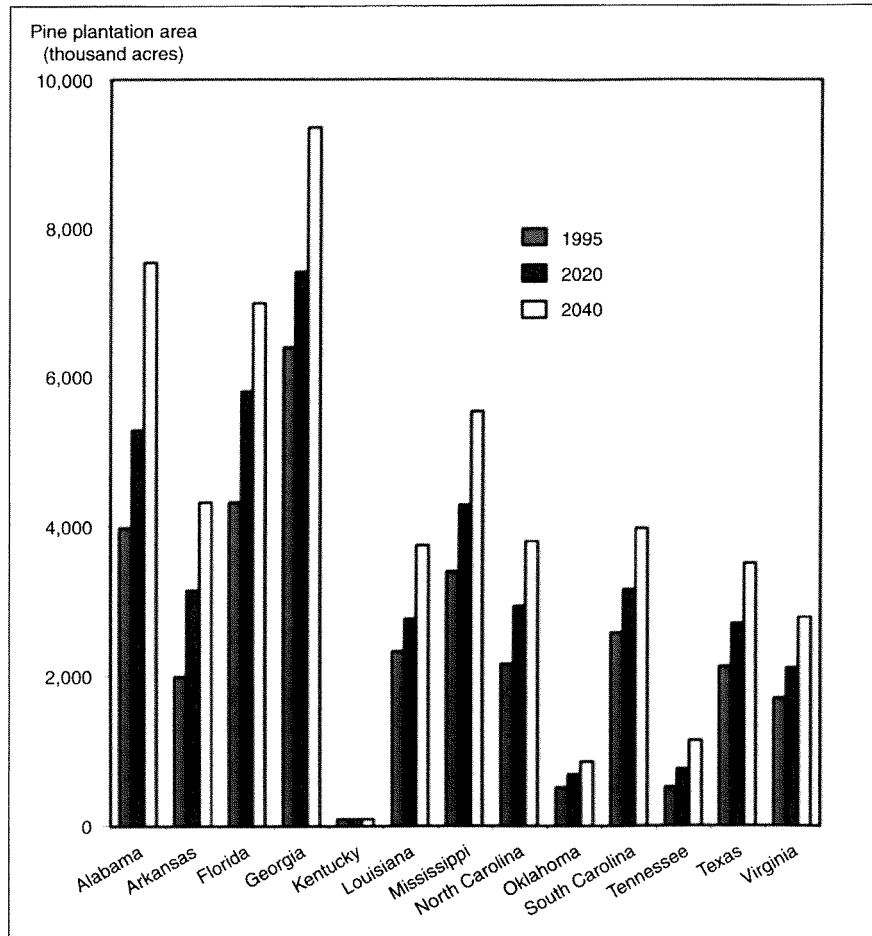


Figure 4. Pine plantation area by state on private land in the South for 1995, 2020, and 2040, as projected by SRTS, under the base case (IH) scenario, with inelastic demand and high pine plantation growth rate increases.

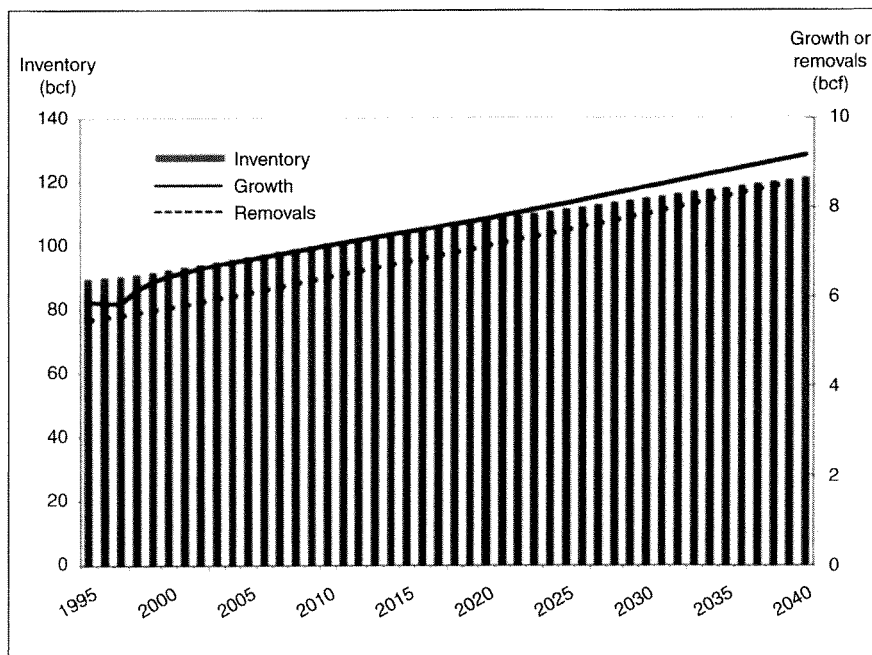


Figure 5. Subregional Timber Supply model projections of softwood timber growth and removals volumes (bcf) on private timberland in the South, 1995–2040, under the base case (IH) assumptions of inelastic timber demand and high plantation volume growth rate increases.

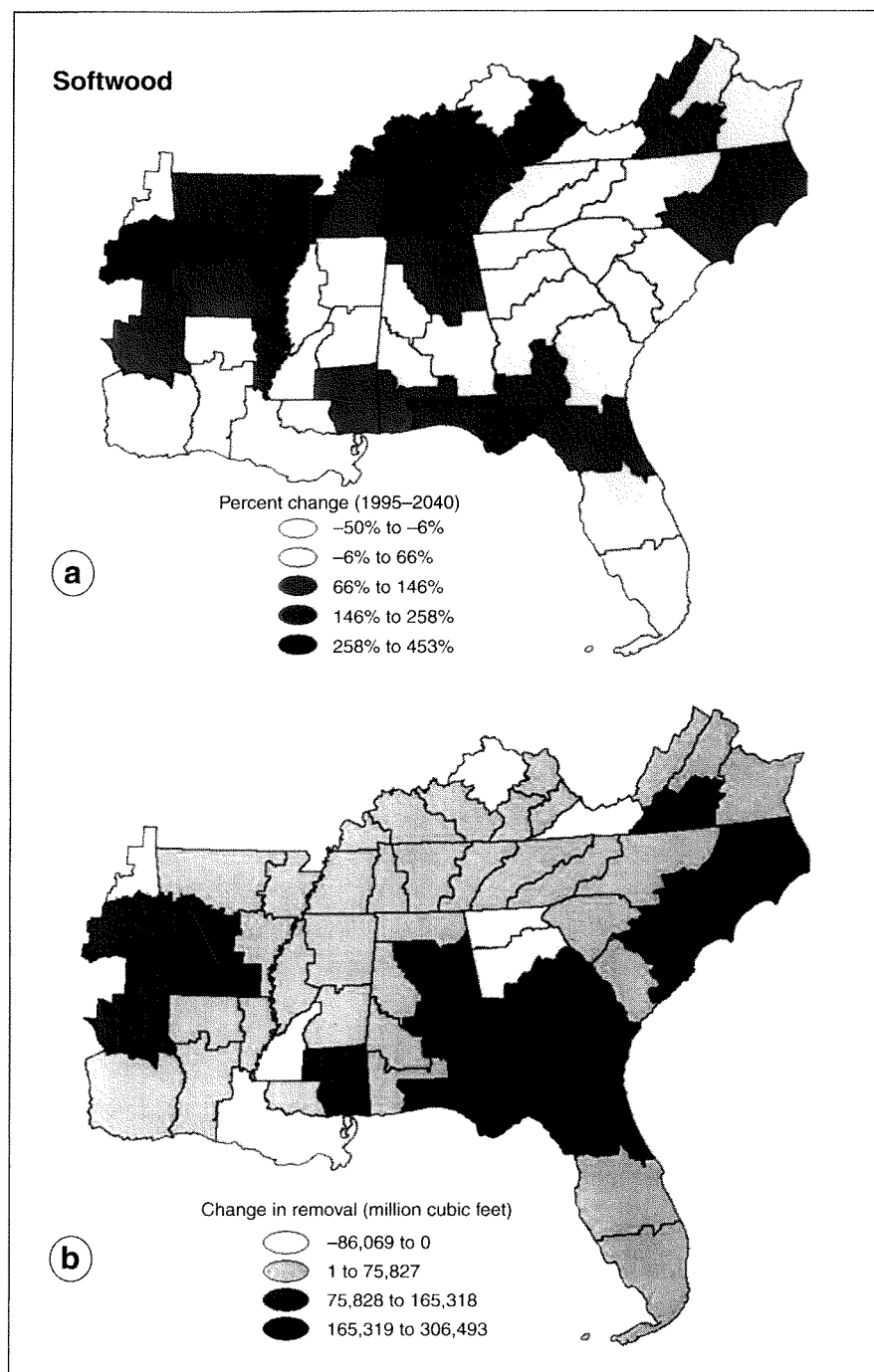


Figure 6. Percentage (a) and absolute (b) changes in annual softwood harvest levels, 1995–2040, as projected by the Subregional Timber Supply model projections, by FIA survey, under the base case (IH) assumptions of inelastic timber demand and high plantation volume growth rate increases.

Piedmont and mountains of North Carolina and Virginia, central Tennessee, and the Ozarks of Arkansas).

Even parts of the South projected to lose forest area would experience increased softwood harvests. This increase comes not only from rising growth rates on plantations but also from timber entering the market as forests are converted to nonforest uses; the Piedmont

and Florida are examples of this. Other places (parts of Mississippi, Arkansas, and Louisiana) are projected to have decreased harvests even if forest area might be stable or rising, because many of the expected new acres of pine plantations will not be harvested until after 2040.

In aggregate, softwood harvests from private lands are projected to increase by 56 percent between 1995 and

2040 under the IH scenario. This results from both the increase in the area of pine plantations and the projected rise in productivity of those plantations. Pine plantations, which yield wood at least 50 percent faster than natural pine stands, now account for nearly half of southern timber volume growth. Rising productivity over time means that more wood can be produced on a smaller land base. In other words, the projection shows a large shift in the share of harvests from natural forest management types to pine plantations. The effect then is to raise the harvest intensity (harvest volume per acre) on plantation pine stands and lower it on natural types over time.

Natural forests. Projected changes in natural forest management types under the IH scenario also vary by state (fig. 7). All states are projected to lose acreage in natural forest types under this scenario. The states with the greatest loss in natural forest types are Florida (58 percent), South Carolina (35 percent), and North Carolina (30 percent)—the result of pine plantation expansion plus a loss of forests to residential and urban uses. In other scenarios, the losses projected for natural forest management types in those states are similar, and the same states are projected to lose most.

Hardwoods. Intensive silviculture has not been widely applied in hardwoods. Assuming no major change in management practices, hardwood growth is projected to stay ahead of removals only through the mid-2020s, after which hardwood inventory is projected to decline. This finding is common to all scenarios and is displayed graphically in figure 8 in the base case (IH). Here, growth is projected to exceed removals until about 2025, when removals overtake growth. Much of the increasing rate of removals can be ascribed to a growing demand for hardwood fiber for engineered wood products, especially structural and nonstructural wood panels (Haynes et al. 2002).

Hardwood harvests from private lands are projected to change unevenly across the South. In percentage terms, projected increases are largest for the northern and western parts of the South (e.g., Kentucky, Tennessee,

northern Alabama, northern Arkansas), where these harvests will be mostly from areas not projected to lose forests. In Florida, however, the projected harvests will often be associated with conversion from forest to urban uses (*fig. 9a, p. 22*). Total volume will likely reflect a combination of harvests entering the market as hardwood stands are converted to nonforest uses and to pine plantations, and higher harvesting rates in remaining hardwood forests (*fig. 9b, p. 22*).

Inventories. Changes in inventory resulting from private timberland area fluctuations, management type area shifts, and plantation growth vary considerably across subregions of the South. For most states, inventories of both hardwood and softwood are projected to exceed those present in 1995. Also for most states, growth and removals of both hardwood and softwood species are projected to increase through 2040, but there are notable exceptions, including Mississippi and South Carolina, where hardwood removals outpace growth during the entire projection. The falling hardwood inventories in many areas can be ascribed primarily to vigorous conversion of natural forest management types to pine plantations. Softwood inventories in both Mississippi and South Carolina are projected to rise through 2040. Kentucky and Oklahoma, with large inventories relative to local demand, are projected to have steadily rising inventories of both hardwood and softwood throughout the period.

Discussion and Conclusions

Projections suggest that the southern United States will remain the largest single producer of timber products in the world. The South has become increasingly prominent in domestic timber product markets because of rapidly increasing productivity on private land, improved product manufacturing technology, and the shrinking timber harvests in other parts of the country. Softwood growth will easily accommodate higher harvest volumes because of continual expansion of pine plantation area and faster growth on those acres, but hardwood resources will see increased harvests as well.

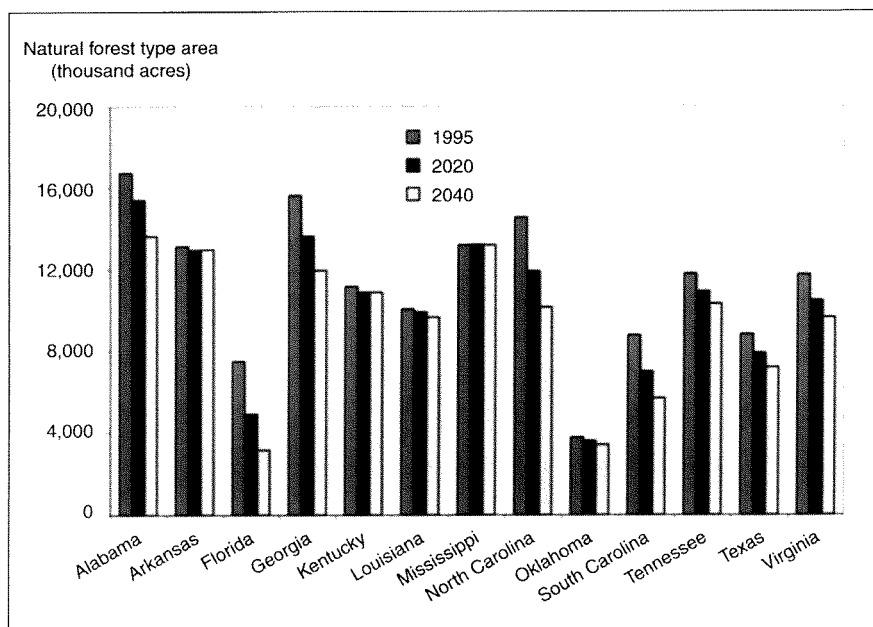


Figure 7. Natural forest management type (natural pine, oak-pine, upland hardwood, bottomland hardwood) area on private timberland by state in the South for 1995, 2020, and 2040, as projected by SRTS, under the base case (IH) scenario, with inelastic demand and high pine plantation growth rate increases.

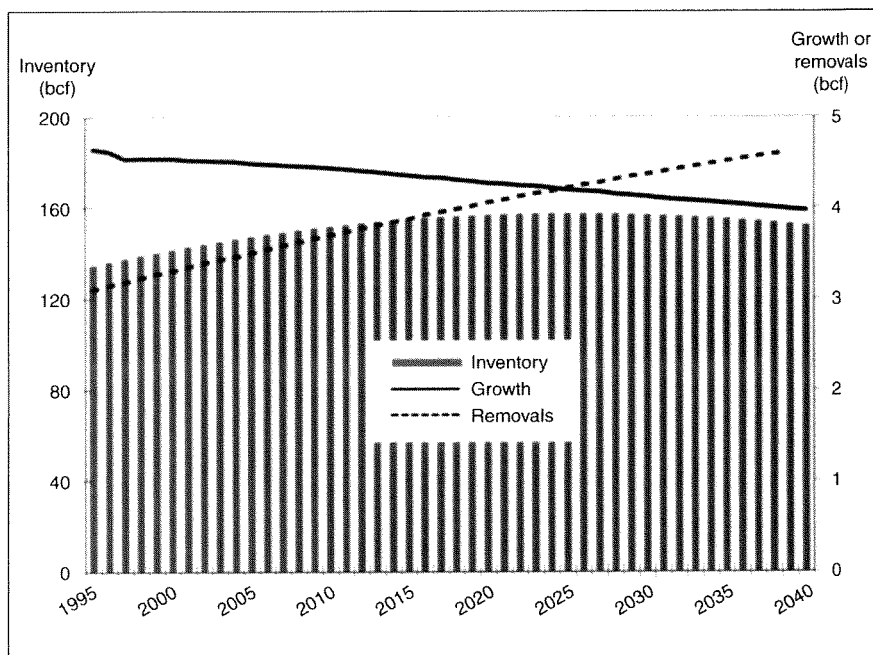


Figure 8. Subregional Timber Supply model projections of hardwood timber growth and removals volumes (bcf) on private timberland in the South, 1995-2040, under the base case (IH) scenario assumptions of inelastic demand and high plantation volume growth rate increases.

Decreases in the area of private timberland in natural forest management types will come from projected increases in pine plantations and the liquidation of forests to accommodate urban expansion. Land-use pressures are projected to depress the total area of timberland in some parts of the South,

especially in the heavily populated Atlantic Coast states. The loss of timberland in these areas is projected to be offset by gains in some parts of the South's northern and western regions.

Projected increases in acreage and growth rates of southern pine plantations imply that forest product manu-

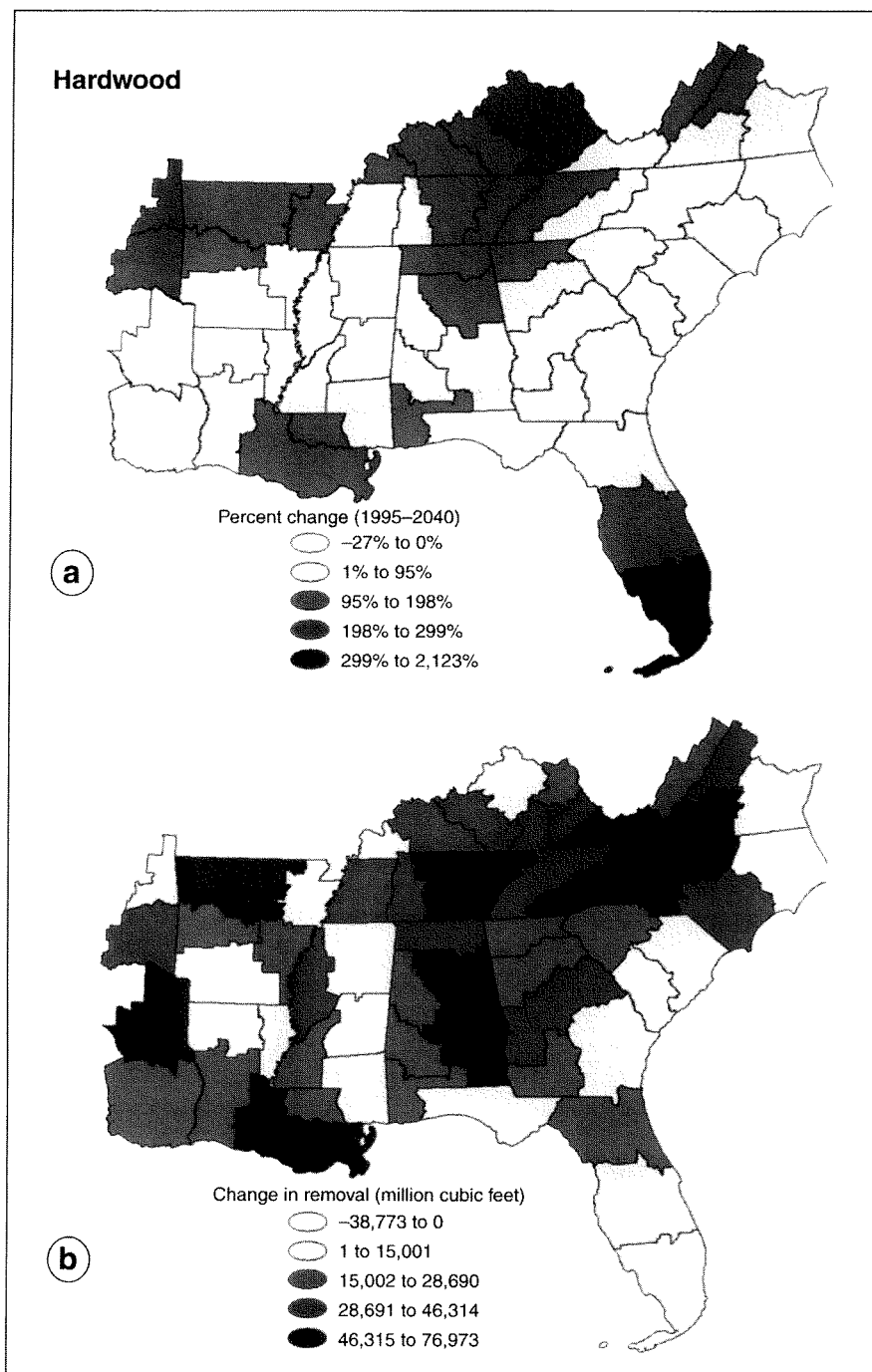


Figure 9. Percentage (a) and absolute (b) changes in annual hardwood harvest levels, 1995–2040, as projected by the Subregional Timber Supply model projections, by FIA survey unit under base case (IH) assumptions of inelastic demand and high plantation volume growth rate increases.

facturing opportunities will improve. Investment opportunities will exist for developing capacity and technology to utilize small-diameter logs coming from pine plantations. But such economic opportunities may have to be squared with, or be limited by, issues surrounding the losses of natural forest types and their associated ecological values.

Our projections were based on steadily increasing national income and demand, consistent with historical evidence and published RPA projections. To the extent that such income and demand growth do not materialize, results would differ: Harvest pressures would be lower, and plantation areas might not increase as much. The issue is complex, however, because rising

timber demand also translates into lower pressure to convert forest to other uses and fewer incentives to convert agricultural land to forest. More robust projections will require additional research that fills several information gaps, including a more refined understanding of how land uses can be projected at fine scales, how changes in landowner demographics will affect timber supply, and how urbanization and demographic changes are likely to fragment both forests and their ownership. Projections would be improved with better data on forest conditions and uses and land-use trends compiled at finer scales of resolution.

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